

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Petition to Adopt Service Rules for Unmanned	)	RM-11798
Aircraft Systems (“UAS”) Command and	)	
Control in the 5030-5091 MHz Band	)	

**COMMENTS OF CTIA**

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## EXECUTIVE SUMMARY

Unmanned Aircraft Systems (“UAS”) operations, supported by our nation’s wireless networks, offer great promise in a variety of sectors, from infrastructure inspection and public safety to package delivery and mapping. In CTIA’s view, proposals made by the Aerospace Industries Association (“AIA”) in its petition for service rules for the 5030-5091 MHz band (the “AIA Petition”) could compromise this potential. Before moving forward with the AIA Petition, the Federal Communications Commission (the “Commission”) should take account of the broader UAS context and consider approaches for the 5030-5091 MHz band and other potential UAS spectrum that are flexible, forward-looking, and technology-neutral. The right approach by the Commission will support the rapidly-evolving UAS industry.

In these comments, CTIA encourages the Commission to consider a number of issues before releasing a Notice of Proposed Rulemaking (“NRPM”) in response to the AIA Petition. As a threshold matter, the vague nature of the AIA Petition makes it unclear if AIA is suggesting either: (a) an overly broad approach that would require all UAS to utilize the 5030-5091 MHz band for command and control links under Part 87 rules; or (b) an extremely narrow approach, based on standards developed by the Radio Technical Commission for Aeronautics (“RTCA”), reserving this band only for UAS that are transitioning in and out of Class A airspace, above 18,000 feet. Additional clarity is needed, and the Commission should consider the following four additional issues before releasing an NPRM in this proceeding.

First, there is no one-size-fits-all approach to UAS spectrum solutions, as UAS operations vary significantly and their spectrum needs are not homogenous. Networked cellular, satellite, other licensed and unlicensed bands and hybrid approaches, including the 600 MHz, 700 MHz, 1.7 GHz, 2.1 GHz and 5.9 GHz bands, are all available and suitable to meet the needs of UAS at varying altitudes. Although the AIA Petition does not acknowledge these other UAS spectrum options, it is imperative that the Commission recognizes them, and does not impose use of the 5030-5091 MHz upon all UAS operators.

Second, the Commission should refrain from reserving the 5030-5091 MHz spectrum for specific operations and omitting others by exclusion. The Commission’s approach to UAS spectrum should be consistent with its approach to spectrum allocations and service rules generally, valuing flexibility and neutrality as to users and technologies. Technology-neutral rules do not require the Commission to determine possible future uses or users of the band, focusing instead on enabling industry to use spectrum innovatively as technology and use cases evolve. Technology-neutral rules are especially important for UAS, where the pace of technical evolution is accelerated.

Third, the Commission should reject the AIA proposal to prohibit use of the 5030-5091 MHz band for UAS operations that are “non-safety” and “non-route.” Most categories of UAS anticipated today will not be flown along pre-determined routes. Neither the International

Telecommunication Union (“ITU”) nor the Commission included this prohibition in the recommendations or allocation for the band, and the Commission should not adopt service rules that have the effect of excluding the majority of UAS from the band.

Finally, the Commission should not, as AIA suggests, utilize Part 87 rules designed for *manned* aviation services to govern *unmanned* operations in the 5030-5091 MHz band, or any other band. AIA justifies using Part 87 by stating that the band is allocated to Aeronautical Mobile Route Services (“AM(R)S”). However, prior operations authorized for AM(R)S directly supported *manned* aviation. Application of Part 87 rules may be appropriate for the narrow UAS use cases envisioned by AIA’s members, but are not appropriate for most categories of UAS under development today. It is not appropriate to impose manned aviation requirements on operations that are, by their very definition, unmanned.

A forthcoming NPRM in this proceeding would be the first opportunity for the Commission to develop service rules specifically for UAS. As the Commission moves forward, it is important that it not create precedent with the 5030-5091 MHz band, including regulation under Part 87, which would limit the use of other spectrum bands for UAS. Many UAS interests intend to use commercial wireless solutions to meet their spectrum needs. Implementation of the AIA Petition could have unintended consequences that would confuse the ability of UAS operators to use wireless services that are commercially available today. In order to support the greatest number of UAS operations and realize the full economic potential of UAS, the Commission must ensure that it neither imposes a particular spectrum band or technological solution on all UAS, such as the 5030-5091 MHz band, nor precludes UAS operators from accessing the spectrum needed to support emerging operations. The UAS market is continuously changing and growing, and the Commission’s approach must remain flexible and technology-neutral.

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**COMMENTS OF CTIA**

CTIA<sup>1</sup> files these comments in response to the petition filed by the Aerospace Industries Association (“AIA”)<sup>2</sup> requesting that the Federal Communications Commission (the “Commission”) begin a rulemaking to adopt service rules for UAS command and control in the 5030-5091 MHz band (the “AIA Petition”).<sup>3</sup>

**I. INTRODUCTION AND BACKGROUND**

CTIA engages with policymakers, including the Federal Aviation Administration (“FAA”), to address how commercial wireless technology (often referred to as “networked cellular” by the FAA and herein), including 4G LTE and 5G, can support UAS communications functions. UAS requires spectrum for a variety of communications functions, including command and control, remote identification and tracking, payload communications and collision

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<sup>1</sup> CTIA® (www.ctia.org) represents the U.S. wireless communications industry and the companies throughout the mobile ecosystem that enable Americans to lead a 21st century connected life. The association’s members include wireless carriers, device manufacturers, suppliers as well as apps and content companies. CTIA vigorously advocates at all levels of government for policies that foster continued wireless innovation and investment. The association also coordinates the industry’s voluntary best practices, hosts educational events that promote the wireless industry and co-produces the industry’s leading wireless tradeshow. CTIA was founded in 1984 and is based in Washington, D.C.

<sup>2</sup> AIA is an association of aerospace and defense manufacturers and suppliers of civil and military aircraft. Members include: The Boeing Company, United Technologies Corporation, Rockwell Collins, Raytheon, and Lockheed Martin Corporation, among others.

<sup>3</sup> See *Petition To Adopt Service Rules for Unmanned Aircraft Systems (“UAS”) Command and Control in the 5030-5091 MHz Band*, RM-11798, Petition for Rulemaking (filed Feb. 8, 2018) (“AIA Petition”).

avoidance. CTIA advocates for flexible policies and standards related to spectrum and wireless infrastructure that will enable the growing UAS industry to flourish.

In November 2017, CTIA released a white paper focused on the role of networked cellular to advance safe and reliable drone operations, including operations beyond visual line of sight.<sup>4</sup> The benefits of using networked cellular to support UAS, particularly at low altitude,<sup>5</sup> include the following:

- 1) **There is a ready ecosystem.** Cellular wireless networks are available and widely used nationwide. UAS operations require nationwide coverage and networked cellular matches that operational need, covering 99.7 percent of the U.S. population;
- 2) **Licensed spectrum provides reliability and security.** Utilizing licensed spectrum for UAS communications functions will provide security, reliability, quality of service and redundancy – features that other spectrum options, including unlicensed bands, and even some aviation protected bands, do not offer;<sup>6</sup>

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<sup>4</sup> See CTIA, *Commercial Wireless Networks: The Essential Foundation of the Drone Industry* (Nov. 13, 2017), available at: <https://www.ctia.org/news/commercial-wireless-networks-the-essential-foundation-of-the-drone-industry-2>.

<sup>5</sup> The particular suitability of networked cellular for low altitude UAS was highlighted at the International Civil Aviation Organization’s DroneEnable conference in September, 2017, where Nikolai Vassiliev of the International Telecommunication Union (“ITU”) gave a presentation examining use of unlicensed bands, licensed bands and aviation protected spectrum for low altitude UAS. After weighing the pros and cons of each, he recommended wireless networks for low altitude UAS communications, elevating it above unlicensed spectrum and aviation protected spectrum. He noted the ubiquitous coverage of wireless networks, which can enable operations beyond visual line of sight, the potential for tracking UAS over mobile networks, the harmonization of the LTE bands, which will assist in trans-border operations, and the evolving nature of LTE networks and 5G, which will provide even better coverage, and dynamic data traffic management in the future. With respect to unlicensed bands, Vassiliev said that the main disadvantages include lack of interference protection or quality of service assurances. Further, Vassiliev explained that unlicensed bands are used mainly for recreational UAS operations within line-of-site and may be not suitable for beyond-line-of-sight communications and professional UAS, and unlicensed bands are not globally harmonized. Usage of unlicensed bands for UAS varies by country, for example the 27 MHz, 34 – 35 MHz, 40 MHz, 2.4 GHz, 5.8 GHz bands are available for unlicensed use in some countries, but not others. With respect to aviation-protected bands, Vassiliev said that, while these bands are exclusive and protected from interference, they offer limited capacity and are congested from intensive usage.

<sup>6</sup> For example, Automatic Dependent Surveillance-Broadcast (“ADS-B”) is an unencrypted protocol and therefore more vulnerable to hacking and spoofing. See UAS Identification and Tracking (“UAS ID”) Aviation Rulemaking Committee (“ARC”), *ARC Recommendations Final Report*, at 15, Appendix B (released December 18, 2017), available at:

- 3) **Wireless networks provide authentication and security.** The wireless industry has a long history of working to protect customers, networks, and technology from cyber threats. Networked cellular is equipped with a variety of security approaches, including authentication technologies that validate and authorize users. These technologies protect network users—and will protect UAS drone operations, data integrity and privacy. In contrast, communications on unlicensed and aviation-specific spectrum bands can lack security and encryption capabilities;
- 4) **The wireless industry’s global standards enable interoperability.** 4G LTE and 5G are ongoing, non-proprietary standards developed through global, industry-based consensus. Globally-harmonized standards will provide the consistency and interoperability needed for a global UAS market. For companies that are planning to use UAS across countries and borders, global interoperability is essential. Looking ahead, 5G will enable UAS deployments on an even wider scale, with reduced latency and increased responsiveness and airborne collision avoidance capabilities; and
- 5) **Wireless devices are readily available for UAS interfaces.** Widely available smartphones and tablets already interface both with UAS and networked cellular.<sup>7</sup> Most law enforcement agencies that need to remotely track and identify UAS already have access to wireless networks, smartphones and tablets, enabling a seamless transition to this important safety function.<sup>8</sup>

Many UAS interests intend to use networked cellular solutions to meet their spectrum needs, including, but not limited to, command and control. Indeed, numerous awardees in the recently announced UAS Integration Pilot Program (“IPP”) projects will use networked cellular solutions. CTIA members’ wireless networks, devices and components will support operations across the

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[https://www.faa.gov/regulations\\_policies/rulemaking/committees/documents/media/UAS%20ID%20ARC%20Final%20Report%20with%20Appendices.pdf](https://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/UAS%20ID%20ARC%20Final%20Report%20with%20Appendices.pdf)

<sup>7</sup> The benefits of networked cellular were discussed at length by the FAA at the 2018 FAA UAS symposium. For instance, Sean Torpey, Acting Deputy Assistant Administrator for Information & Technology and Chief Information Officer, spoke about the UAS user’s need to operate and interact with their cell phones, the ability of smartphones to provide a seamless user interface, and the importance of making sure data is secure and available, which are key benefits of networked cellular.

<sup>8</sup> During the 2018 FAA UAS Symposium, Josh Holtzman, FAA’s Director of the Office of National Security Programs and Incident Response (AEO), spoke to the benefits of using networked cellular solutions for UAS when he referenced law enforcement’s needs for app-based solutions that utilize their existing equipment, including the smartphones used by law enforcement today.

numerous IPP projects in ten states, including North Carolina, Kansas, Nevada, California, and Virginia.<sup>9</sup>

In light of the availability and suitability of networked cellular solutions to meet the growing spectrum demands of UAS, and considering the wide variety of UAS operations under development, the Commission must develop flexible, forward-looking and technology-neutral spectrum policies for 5030-5091 MHz and other bands intended for use in UAS operations. Before the Commission issues a Notice of Proposed Rulemaking (“NPRM”) in this proceeding, it should first contemplate the right spectrum approach for many categories of UAS and avoid rushing ahead with the AIA proposals, which could have unintended consequences. Second, the Commission should propose service rules for the 5030-5091 MHz spectrum that are flexible and will allow use of this spectrum by a variety of UAS, not just those transitioning to and from Class A airspace, as AIA suggests. Moreover, the Commission should reject the AIA proposal that would prohibit use of the band for UAS operations that are “non-safety” and “non-route.” Finally, the Commission should not, as AIA suggests, utilize Part 87 rules designed for *manned* aviation services to govern *unmanned* operations in the 5030-5091 MHz band, or any other band. A forthcoming NPRM in this proceeding would be the first opportunity for the Commission to develop service rules specifically for UAS, and it is important that the Commission not create precedent, including regulation under Part 87, which will be harmful to using other spectrum bands for UAS.

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<sup>9</sup> Federal Aviation Administration, *Integration Pilot Program Awardees* (May 9, 2018), available at: [https://www.faa.gov/uas/programs\\_partnerships/uas\\_integration\\_pilot\\_program/awardees/](https://www.faa.gov/uas/programs_partnerships/uas_integration_pilot_program/awardees/).



## **II. THE COMMISSION MUST CONTEMPLATE THE RIGHT SPECTRUM APPROACH FOR MANY CATEGORIES OF UAS.**

Although the AIA Petition presents one of the first opportunities for the Commission to consider service rules for UAS spectrum, it does not reflect the evolving universe of UAS operations and their associated communications needs. The Commission should take this moment to consider its role and the role of the FAA,<sup>10</sup> to develop a flexible approach for UAS spectrum that will support the growing and changing needs of UAS in every category. CTIA cautions the Commission that implementing the AIA Petition's proposals could confuse the ability of UAS operators to use wireless services that are commercially available today and in the near future.

### **A. The Commission Should Recognize That UAS Operations are Not Homogenous; There is No One-Size-Fits-All Approach to UAS Spectrum Solutions.**

One of the essential problems with the AIA Petition is that it does not explain the evolving categories of UAS and aircraft that will be used for Urban Air Mobility ("UAM"), each of which will require spectrum to satisfy communications functions. CTIA agrees with past comments made by the Small UAV Coalition and cited by the Commission in the Allocation Order for the 5030-5091 MHz band,<sup>11</sup> "that UAS technology is developing quickly" and that the Commission should "adopt a flexible allocation and, ultimately, flexible service rules that allow the market and advances in technology to dictate the best uses of the spectrum over time."<sup>12</sup>

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<sup>10</sup> The Commission's role is to support competition, innovation and investment in communications and information technology, enabling effective and safe communications through coexistence among spectrum users. *See* 47 U.S.C. § 151. The FAA's role is aviation safety. *See* 49 U.S.C. § 106 (g)(1)(A). The Commission should adopt rules that are expansive and permissive to allow the United States to reap the benefits of new and innovative technologies.

<sup>11</sup> *Amendment of Parts 2, 15, 80, 90, 97, and 101 of the Commission's Rules Regarding Implementation of the Final Acts of the World Radiocommunication Conference* (Geneva, 2012) (WRC-12), ET Docket No. 15-99, Report and Order, FCC 17-33, at ¶ 42 (2017) ("Allocation Order").

<sup>12</sup> *See* Comments of the Small UAV Coalition, ET Docket No. 15-99, at 9-10 (Aug. 31, 2015).

CTIA agrees that a flexible approach is needed. The Commission should propose service rules for the 5030-5091 MHz band that are flexible enough to accommodate a wide variety of UAS under development, including the future needs of electric vertical takeoff and landing (“eVTOL”)/UAM vehicles. The Commission should consider that UAS operations at every altitude require suitable spectrum solutions for a range of operations, including, but not limited to the following:

- Small UAS, weighing less than 55 pounds, providing newsgathering, infrastructure inspection, and package deliveries below 400 feet;
- Small UAS operating at higher altitudes for search and rescue operations;
- Large UAS operating at lower altitudes for precision agriculture;
- UAM aircraft that will offer automated air taxis and aerial ride sharing at up to 2,500 feet,
- Remotely piloted jets, commercial airliners and cargo airplanes operating at 30,000 feet in the navigable airspace, and
- Large UAS operating in the stratosphere providing Internet connections to unserved areas around the globe.

A one-size-fits-all approach will not work to satisfy the communications needs of each of the foregoing use cases. The 5030-5091 MHz band is only one of many bands available for UAS communications, but the AIA Petition does not make this clear. Networked cellular, satellite, other licensed and unlicensed bands, and hybrid approaches, including the 600 MHz, 700 MHz, 1.7 GHz, 2.1 GHz and 5.9 GHz bands, are also available and suitable to meet the needs of UAS and UAM at varying altitudes and for various functions. In addition, there are a number of studies underway to examine the use of other bands for UAS communications, including experiments at 800 MHz, 2.3 GHz, 351 MHz, 362.25 MHz, and 1670-2375 MHz, among

others.<sup>13</sup> The Commission should be mindful as it approaches the AIA Petition not to create precedent with this one band, including regulation under Part 87, which will obstruct the ability to use other spectrum bands, and other Commission rule parts, for UAS.

### **III. THE COMMISSION MUST PROPOSE SERVICE RULES FOR 5030-5091 MHZ SPECTRUM THAT NEITHER IMPOSE USE OF THE BAND ON ALL UAS, NOR RESTRICT ITS USE TO ONLY ONE NARROW CATEGORY OF LARGE UAS TRANSITIONING TO AND FROM CLASS A AIRSPACE.**

The vague nature of the AIA Petition makes it unclear if AIA is suggesting either: (a) an overly broad approach that would require all UAS to utilize the 5030-5091 MHz band for command and control links under Part 87 rules; or (b) an extremely narrow approach by reference to standards developed by the Radio Technical Commission for Aeronautics (“RTCA”)<sup>14</sup> that would reserve this band only for UAS that are transitioning in and out of Class A airspace, above 18,000 feet. The Commission should gain clarity on these issues before issuing an NPRM in this proceeding.

#### **A. The Commission Should Not Read the AIA Petition’s Lack of Clarity as Suggesting that All UAS Must Use the 5030-5091 MHz Band for Command and Control.**

Because the AIA Petition defines UAS so broadly, it could be inferred that AIA intends that all UAS command and control communications should be conducted using the 5030-5091

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<sup>13</sup> For example, Rockwell Collins is testing beyond visual line-of-sight (“BVLOS”) operations below 400 feet in the 800 MHz band (Call Sign WI2XZE, File No. 0451-EX-CN-2017); Aerovironment, Inc is testing various BVLOS mission types using, using 2.3 GHz for uplink command and control and downlink video and telemetry transmissions (Call Sign WI2XVI, File No. 0121-EX-CN-2017); and Raytheon is testing small radios weighing less than 1 oz. on 351 MHz and 362.25 MHz for line-of-sight communications (Call Sign WI2XTE, File No. 0128-EX-CN-2017); Lockheed Martin is using the 1670.00 - 2375.00 MHz band to test UAS at 15,000 feet (Call Sign WI2XSE, File No. 0134-EX-CN-2016).

<sup>14</sup> RTCA is an FAA-chartered Advisory Committee that supports FAA activities by managing various sub-committees that provide recommendations on specific aviation-related issues. RTCA is chartered to combine stakeholder requirements, analyze solutions to aviation challenges. RTCA standards are referenced, and sometimes modified, by the FAA in its regulatory and procurement efforts. RTCA’s membership is comprised of commercial aviation stakeholders, representing airlines, airports, manufacturers, and infrastructure operators, among other groups. Major industry members include Boeing, Leidos, Rockwell Collins, MITRE, and the Air Line Pilots Association.

MHz band according to Part 87 service rules. This would be a mistake. As discussed previously, many UAS operators intend to use networked cellular solutions to meet their spectrum needs, including, but not limited to, command and control, remote identification and tracking, payload communications and collision avoidance.

Adding to the confusion, the AIA Petition makes inapplicable correlations between its proposals, as described above, and programs intended for small UAS below 400 feet, such as the IPP.<sup>15</sup> For example, AIA cites the IPP as a justification for the Commission to act on the AIA Petition.<sup>16</sup> The goal of the IPP is to study integration of small low-altitude UAS in local airspace at ground level to 400 feet, not to study unmanned commercial airliners operating in Class A airspace at 18,000 feet to approximately 60,000 feet. It is important that the Commission understands the differences among these UAS operating scenarios, which AIA surely does, in order to implement appropriate and flexible regulations and approaches that set the right precedent for UAS communications solutions, generally.

**B. The Commission Also Should Not Reserve the 5030-5091 MHz Band for One Narrow Use Case, UAS Transitioning To and From Class A Airspace.**

Notwithstanding the ambiguity of the AIA Petition as described above, it appears that the AIA Petition, by reference to RTCA standards, would reserve this spectrum for one narrow use

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<sup>15</sup> See Federal Aviation Administration, *Unmanned Aircraft Systems Integration Pilot Program—Announcement of Establishment of Program and Request for Applications*, 82 Fed. Reg. 51904-05 (Nov. 8, 2017) (“Consistent with the Presidential Memorandum, the DOT has established four objectives for the Program: (1) to accelerate the safe integration of UAS into the NAS by testing and validating new concepts of beyond visual line of sight operations in a controlled environment, focusing on detect and avoid technologies, command and control links, navigation, weather and human factors; (2) to address ongoing concerns regarding the potential security and safety risks associated with UAS operating in close proximity to human beings and critical infrastructure by ensuring that operators communicate more effectively with Federal, State, local, and tribal law enforcement to enable law enforcement to determine if a UAS operation poses such a risk; (3) to promote innovation in and development of the United States unmanned aviation industry, especially in sectors such as agriculture, emergency management, inspection services, and transportation safety, in which there are significant public benefits to be gained from the deployment of UAS; and (4) to identify the most effective models of balancing local and national interests in UAS integration.”).

<sup>16</sup> See AIA Petition at 2.

case – unmanned commercial jetliners and cargo planes operating in, and transitioning to and from, Class A airspace.<sup>17</sup> This use case does not reflect the myriad other UAS operations not addressed by the RTCA standards.

Reference to the RTCA standard on which the AIA Petition is based reveals that the proposed service rules are “focused on the transitioning of a UAS to and from Class A or special use airspace.”<sup>18</sup> Class A airspace extends from 18,000 feet to approximately 60,000 feet and all aircraft operating in Class A airspace (including jets, turboprop planes and commercial airliners) must operate under Air Traffic Control. These types of aircraft may not operate as unmanned vehicles for many years. Many categories of UAS, particularly small UAS and UAS operated at low altitude, will not operate in or transition to and from Class A airspace, the area of RTCA’s focus. Instead, these vehicles will operate under some other form of air traffic management, such as the Low Altitude Authorization and Notification Capability (“LAANC”) today, and an Unmanned Traffic Management System (“UTM”) in the future.<sup>19</sup> Accordingly, the RTCA standard on which the AIA Petition relies for its proposed service rules for the 5030-5091 MHz band is overly restrictive, leaving out the majority of UAS operations contemplated today.

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<sup>17</sup> AIA states that “communications utilizing the band should be strictly limited to command and control and safety-of-life operations.” AIA Petition at ii, 10. AIA also notes that “the need for access to the 5030-5091 MHz band . . . will greatly exceed the capacity of this spectrum.” *Id.*

<sup>18</sup> RTCA Special Committee 228, *Terms of Reference* (Sept. 21, 2017), available at: [https://www.rtca.org/sites/default/files/sc-228\\_sept\\_2017\\_tor.pdf](https://www.rtca.org/sites/default/files/sc-228_sept_2017_tor.pdf).

<sup>19</sup> LAANC is a collaboration between the FAA and the UAS industry that provides access to controlled airspace near airports through near real-time processing of airspace authorizations below approved altitudes in controlled airspace. UTM is a NASA project, in partnership with the FAA and the UAS industry, that is developing a low-altitude traffic management system that will enable airspace management for small UAS in a safe, efficient, and fair manner.

**C. The Commission Should Take a Technology-Neutral Approach Rather than Proposing to Reserve the Band for One UAS Use Case.**

In CTIA’s view, the Commission should reject the AIA Petition’s apparent approach, which would reserve the 5030-5091 MHz spectrum for one use case. The UAS market is rapidly developing and the Commission cannot possibly anticipate all the UAS use cases that may be suitable for this spectrum. The Commission should adopt service and eligibility rules for the 5030-5091 MHz spectrum that are flexible and allow for use of this spectrum by other types of UAS and UAM, relying on the FAA to address the safety issues.

The Commission’s approach to UAS spectrum should be consistent with its approach to spectrum allocations and service rules, valuing flexibility and neutrality as to users and technologies. The Commission’s policy promoting flexible use of spectrum is well-established, and there is no reason to deviate from that policy here. As the Commission has stated: “[F]lexibility will...ensure spectrum is put to its most beneficial use, and maximize the probability of success for new services...[W]e expect that flexibility will allow any licensee...[to] maximize the value of the spectrum resource both to the licensee and to the public.”<sup>20</sup> Technology-neutral rules do not require the Commission to determine possible future uses or users of the band, focusing instead on enabling industry to use available spectrum innovatively as technology and use cases evolve.<sup>21</sup> Technology-neutral rules are especially

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<sup>20</sup> RTCA Special Committee 228, *Terms of Reference* (Sept. 21, 2017), available at: [https://www.rtca.org/sites/default/files/sc-228\\_sept\\_2017\\_tor.pdf](https://www.rtca.org/sites/default/files/sc-228_sept_2017_tor.pdf).

<sup>21</sup> The Commission has a long history of adopting technology-neutral rules. *See, e.g., In the Matter of Connect America Fund, et. al.*, WC Docket No. 10-90, Report and Order and Further Notice of Proposed Rulemaking, FCC 11-161, at ¶ 1 (2011) (establishing a “a framework to distribute universal service funding in the most efficient and technologically neutral manner possible”); *In the Matter of Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, et. al.*, CC Docket No. 02-33, Report and Order, FCC 05-150, at ¶ 4 (2005) (describing the Commissions “objective to create a broadband regulatory regime that is technology and competitively neutral”); *The Establishment of Policies and Service Rules for the Non-Geostationary Satellite Orbit, Fixed Satellite Service in the Ka-Band*, IB Docket 02-19, Report and Order, FCC 03-137, para. 10 (2003) (“our choice should be technologically neutral, not favoring any particular technology or operational method”).

important for UAS operations, in which the pace of technical evolution is further accelerated. The near-term applications of UAS and UAM could not have been conceived a decade ago, much less five decades ago when the Commission promulgated Part 87 rules. The Commission must ensure that its treatment of spectrum for UAS and UAM will not impede ongoing innovation.

In order to support the greatest number of UAS and UAM operations, and realize the full economic potential of UAS and UAM, the Commission must ensure that it neither imposes a particular spectrum or technological solution on all UAS, nor precludes UAS operators from accessing spectrum needed to support emerging operations. This market is continuously changing and growing, and the Commission's approach must remain flexible and technology-neutral in order to ensure availability of spectrum for UAS and UAM.

**D. It Would Be Premature for the Commission to Develop Service Rules Based on Ongoing RTCA Standards Development.**

As discussed earlier, the AIA Petition is premised on RTCA's Minimum Operational Performance Standards ("MOPS") for UAS command and control links. The MOPS is the output of Phase One of RTCA's standards work on UAS command and control links. Phase Two is underway, aiming to incorporate beyond-radio-line-of-sight ("BRLOS") operations and small UAS into the standards development. As RTCA has acknowledged, "there is a need to address emerging requirements driven by changes in the UAS market needs and how they impact required C2 performance and implementation limitations. . . There is a need to support smaller UAS, operating BRLOS, which have significant size, weight and power limitations and are anticipated to be deployed in larger numbers than considered previously."<sup>22</sup>

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<sup>22</sup> RTCA Special Committee 228, *Terms of Reference* (Sept. 21, 2017), available at: [https://www.rtca.org/sites/default/files/sc-228\\_sept\\_2017\\_tor.pdf](https://www.rtca.org/sites/default/files/sc-228_sept_2017_tor.pdf).

The FAA has queried RTCA about why it did not develop its Phase One standard with LTE compatibility in mind. In RTCA’s ongoing Phase Two work it will evaluate a “concept of operations and operating environment description for smaller UAS operating at lower altitudes,”<sup>23</sup> but it remains unclear if LTE compatibility is a goal. Service rules for the 5030-5091 MHz spectrum based on these RTCA standards would be premature given the ongoing Phase Two work. The Commission should consider whether it is appropriate to move forward with a rulemaking for UAS service rules when the standards presented to date are either too narrowly focused or incomplete.

#### **IV. THE COMMISSION SHOULD NOT PROHIBIT USE OF THE BAND FOR UAS OPERATIONS THAT ARE “NON-SAFETY” AND “NON-ROUTE,” AS AIA SUGGESTS.**

The AIA Petition requests that the Commission “prohibit any use of the 5030-5091 MHz band for payload communications or other *non-safety or non-route services*.”<sup>24</sup> The Commission should reject this request and refrain from adopting service rules that have the effect of excluding the majority of UAS communications from the band. AIA offers no definition of “non-safety” and “non-route” services. Neither the International Telecommunication Union (“ITU”) nor the Commission included this prohibition in the recommendations or allocation for this spectrum band. The AIA Petition requests service rules for the 5030-5091 MHz band that are more restrictive than the allocation requires, and the Commission should reject this request.

AIA’s suggestion appears intended to limit use of the 5030-5091 MHz band to a narrow set of UAS – unmanned large airliners transitioning to and from, and operating in, Class A airspace. Although the Aeronautical Mobile Route Services (“AM(R)S”) is “reserved for

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<sup>23</sup> *Id.*

<sup>24</sup> AIA Petition at 10.



communications relating to safety and regularity of flight, primarily along national or international civil air routes,”<sup>25</sup> these concepts – safety and regularity of flight –apply to all UAS. Moreover, the suggested prohibition against “non-route” services is at odds with the AM(R)S definition which contemplates flights “*primarily* along . . . civil air routes.”<sup>26</sup> The ITU allocation did not seek to restrict communications in the service to those *solely* along civil air routes, but AIA’s proposed prohibition on “non-route” communications would do exactly that.

Most categories of UAS anticipated today will not be flown along pre-determined routes, including UAM operations. Autonomous eVTOL vehicles operating within UAM environments will carry passengers and enable aerial ride sharing. UAM operations, which will carry passengers in furtherance of aerial ride sharing, are a perfect example of the problems introduced by the AIA Petition. It may be desirable for these vehicles to have access to the 5030-5091 MHz band for control links. Yet, AIA’s non-route prohibition would effectively preclude use of the spectrum by any UAS or UAM that travel along dynamic routes that are not civil aviation routes. The Commission should not preclude use of the spectrum for these types of operations.

As the Commission contemplates the AIA Petition, it should ensure that its proposed service rules are sufficiently flexible to accommodate future use of the 5030-5091 MHz band by varying types of UAS and UAM. Flexible service rules will accommodate advances in UAS technology and allow the market and the FAA to determine appropriate uses of the spectrum.

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<sup>25</sup> 47 C.F.R. § 87.5.

<sup>26</sup> See 47 C.F.R. § 87.5.

**V. A FORTHCOMING NPRM WILL BE THE FIRST OPPORTUNITY FOR THE COMMISSION TO DEVELOP UAS SERVICE RULES; PART 87 IS NOT THE RIGHT VEHICLE FOR SUCH RULES.**

The AIA Petition asserts that the Commission should regulate the 5030-5091 MHz band pursuant to Part 87 and its service rules. AIA justifies this by stating that the band is allocated to AM(R)S, without further explanation of why regulating UAS operations under Part 87 would be appropriate.<sup>27</sup> It is not necessary to regulate UAS communications in the 5030-5091 MHz band under Part 87 simply because the spectrum has been allocated to the AM(R)S or is used for airborne purposes. AM(R)S bands have traditionally been assigned to Part 87, but the prior operations conducted according to these rules directly supported *manned* aviation. An NPRM for the 5030-5091 MHz is the first opportunity for the Commission to develop service rules specifically for unmanned aircraft and UAS – Part 87 is not the right vehicle for such rules.

Instead, and consistent with FAA policymaking in this emerging sector, the Commission should take a “deliberate approach that balances the need to deploy this new technology”<sup>28</sup> with the Commission’s mission to encourage the highest and best use of the spectrum. AIA’s unsupported proposition risks unduly constraining evolving UAS operations. Part 87 rules may be appropriate for the narrow UAS use cases envisioned by AIA members, but are not appropriate for most categories of UAS and UAM under development today, or considered in the future. It is not appropriate to impose manned aviation requirements on all UAS.

**A. The Commission Should Reject AIA’s Suggested Approach, Which Would Subject All UAS to Part 87 Regulations Designed for Manned Aviation.**

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<sup>27</sup> AIA Petition at 18.

<sup>28</sup> U.S. Department of Transportation, Federal Aviation Administration, *DOT and FAA Finalize Rules for Small Unmanned Aircraft Systems, Federal Aviation Administration* (June 21, 2016), available at: [https://www.faa.gov/news/press\\_releases/news\\_story.cfm?newsId=20515](https://www.faa.gov/news/press_releases/news_story.cfm?newsId=20515).

The AIA Petition requests that the Commission govern the 5030-5091 MHz band, and all UAS (as defined by AIA), under Part 87 rules – rules that were designed for *manned* aviation. As the FAA has acknowledged, there are critical differences among *manned* aircraft and *unmanned* aircraft, and regulations for each should be appropriate: “UAS operate with widely varying performance characteristics *that do not necessarily align with manned aircraft performance*. They vary in size, speed, and other flight capabilities.”<sup>29</sup> For instance, the amount of onboard equipment and payload capacity of UAS drastically differs from manned aircraft. Additionally, “[s]mall UAS operations pose risk considerations that are different from the risk considerations typically associated with manned-aircraft operations.”<sup>30</sup> As noted by the FAA, “the typical total takeoff weight of a general aviation aircraft is between 1,300 and 6,000 pounds as compared to a total takeoff weight of a small unmanned aircraft of less than 55 pounds,” thus, small unmanned aircraft. . . have the potential to pose significantly less risk to persons and property than comparable operations of a manned aircraft due to differences in the weight of the aircraft.”<sup>31</sup> Moreover, without people onboard a UAS, the risk profile is further reduced. It would not be appropriate to apply rules designed to mitigate these risks in manned aviation to unmanned aircraft.

Importantly, the FAA did not attempt to regulate UAS using manned aviation rules, recognizing that “current UAS technologies were not developed to comply with existing airworthiness standards” and “[c]urrent civil airworthiness regulations may not consider many of

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<sup>29</sup> U.S. Department of Transportation, Federal Aviation Administration, *Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap* (Nov., 7 2013), available at: [https://www.faa.gov/uas/media/uas\\_roadmap\\_2013.pdf](https://www.faa.gov/uas/media/uas_roadmap_2013.pdf).

<sup>30</sup> *Operation and Certification of Small Unmanned Aircraft Systems*, Docket No. FAA-2015-0150, Final Rule, RIN 2120–AJ60, at 16 (2016) (“Part 107 Final Rule”).

<sup>31</sup> *Id.*

the unique aspects of UAS operations.”<sup>32</sup> Instead, the FAA created Part 107 regulations separate from those governing manned aviation. In the press release announcing Part 107, FAA Administrator Michael Huerta described Part 107 as a “careful and deliberate approach that balances the need to deploy this new technology with the FAA’s mission to protect public safety.”<sup>33</sup> If the FAA would not subject UAS to regulations required for manned aviation, neither should the Commission. Rather than regulating all UAS under Part 87, a better approach would leverage existing Commission rule parts that govern spectrum that can be used for UAS, such as Parts, 24, 27, 30 and 90. Alternatively, if this option is not available because a band under consideration for UAS would generally be regulated under Part 87, then the Commission should implement a new rule part for UAS. Either or both of these approaches would be more workable than attempting to retrofit rules intended for manned aviation to accommodate UAS.

Another key problem with the AIA Petition is that it suggests that the Commission adopt a broad definition of UAS, as if there is only one type of aircraft: “an aircraft without a human pilot onboard that is operated remotely by a PIC [Pilot in Command].”<sup>34</sup> The adoption of such a broad definition of UAS in Part 87 would impose unduly restrictive Part 87 rules on the entire UAS industry, which would limit communications options for UAS and could hinder UAS development. Part 87 only authorizes spectrum for “operational control” but UAS operations rely on spectrum for functions beyond command and control, such as remote identification and

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<sup>32</sup> U.S. Department of Transportation, Federal Aviation Administration, *Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap* (Nov., 7 2013), available at: [https://www.faa.gov/uas/media/uas\\_roadmap\\_2013.pdf](https://www.faa.gov/uas/media/uas_roadmap_2013.pdf).

<sup>33</sup> U.S. Department of Transportation, Federal Aviation Administration, *DOT and FAA Finalize Rules for Small Unmanned Aircraft Systems, Federal Aviation Administration* (June 21, 2016), available at: [https://www.faa.gov/news/press\\_releases/news\\_story.cfm?newsId=20515](https://www.faa.gov/news/press_releases/news_story.cfm?newsId=20515).

<sup>34</sup> AIA Petition at 19.

tracking, video and sensor data transmission and detect-and-avoid technologies.<sup>35</sup> Part 87 regulations, focused on control links for manned aviation, cannot accommodate all UAS, or all UAS communications functions, because of the inherent limitations of the Part 87 rules.

**B. Airborne Use of a Spectrum Band Does Not Require Governance Under Part 87.**

The Part 87 Aviation Services rules have a long history and were developed when unmanned aircraft were a matter for science fiction. Many features of the rules predate the Commission itself.<sup>36</sup> The Commission conducted extensive reviews of Part 87 in 1988 and 2001, but has not evaluated whether these longstanding rules governing communications with and between manned aircraft are at all relevant to the unique characteristics and requirements of UAS, and whether governing UAS communications links under Part 87 would be appropriate.

As the Commission knows, airborne use of a spectrum band does not require governance under Part 87. The Commission is considering airborne use of spectrum in other proceedings, and there has been no suggestion in these proceedings that the use of the spectrum should be governed by the Part 87 rules. For example, Part 90 currently permits use of spectrum for airborne purposes, including low-flying aircraft.<sup>37</sup> In a 1970's order permitting airborne use of Part 90 spectrum, the Commission gave examples of permitted uses including water scanning by fisheries, pipeline surveillance in the petroleum and natural gas industries, flying ambulances for hospitals, and numerous local government activities, foreshadowing the functions served by

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<sup>35</sup> See 47 C.F.R. § 87.185 (“Aircraft stations must limit their communications to the necessities of safe, efficient, and economic operation of aircraft and the protection of life and property in the air, except as otherwise specifically provided in this part”); 47 C.F.R. § 87.261 (“Aeronautical enroute stations provide operational control communications to aircraft along domestic or international air routes. Operational control communications include the safe, efficient and economical operation of aircraft, such as fuel, weather, position reports, aircraft performance, and essential services and supplies. Public correspondence is prohibited.”).

<sup>36</sup> The predecessor of the FCC, the Federal Radio Commission, adopted the Aviation Operating Plan in 1929.

<sup>37</sup> 47 C.F.R. §90.423.

UAS today. Similarly, the current NPRM in the 4.9 GHz band explores airborne use, and possible future uses of the band by UAS, which will be governed under Part 90.<sup>38</sup> Moreover the small UAS industry intends to utilize networked cellular, which is governed by commercial wireless service rules in Parts 20, 22, 24 and 27. Clearly, potential airborne use of a spectrum band does not require application of Part 87 service rules.

**C. The Commission Should Reject the AIA Petition’s Definition of UAS, Which Would Require Licensing of a “Pilot in Command.”**

As discussed earlier, AIA’s proposed definition of UAS includes the concept of a “Pilot in Command” or “PIC.” AIA asks the Commission to define a UAS as “an aircraft without a human pilot onboard that is operated remotely by a PIC.”<sup>39</sup> The Commission should refrain from incorporating the definition of UAS under Part 87, and it also should reject the inclusion of the PIC requirement. AIA’s recommendation for a new PIC licensure requirement is inconsistent with FAA regulations and would impose a new certification requirement and test on all UAS operators.<sup>40</sup> The FAA defines an unmanned aircraft as “an aircraft operated without the

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<sup>38</sup> Amendment of Part 90 of the Commission’s Rules, WP Docket No. 07-100, Sixth Further Notice of Proposed Rulemaking, FCC 18-33, at ¶ 3 (2018).

<sup>39</sup> AIA Petition at 19; AIA defines the PIC as the individual operator “responsible for the control of the UAS and all radio communications with the UAS for the command and control of the aircraft, including communications transmitted directly by devices in the possession of the PIC, communications transmitted by the aircraft, and communications transmitted by other (potentially third-party) ground radio facilities used to maintain C2 communications links with the UAS during distant flight.” AIA Petition at 9.

<sup>40</sup> AIA’s PIC requirement is not the only flawed recommended revision of Part 87. AIA also asks the Commission to revise the rules to require equipment authorizations for “Aeronautical Stations and Aircraft Stations that are capable of operating in the 5030-5091 MHz band for use with UAS CNPC link.” AIA Petition at 22. Here again, AIA’s broad definition would bring more UAS operations under Part 87 than would be appropriate and goes beyond the scope of the Commission’s rules for stations operating in the aviation services. Part 87 currently requires equipment authorization for stations “intended for transmission” on the frequencies covered by Part 87. 47 C.F.R. § 87.147(d). Certain radios used on UAS, potentially including those operating in the unlicensed 5 GHz frequencies, may have the technical capability to tune to 5030-5091 MHz, despite the fact that they will not operate on that spectrum. A capability alone should not bring these radios under Part 87. AIA provides no support for such disparate treatment between UAS stations and those used in manned aviation, and its proposal contravenes the Commission’s goal of promulgating technologically neutral regulations.

possibility of direct human intervention from within or on the aircraft.”<sup>41</sup> The FAA chose not to include a PIC in its definition of UAS, and the Commission should not substitute its judgment for that of the expert agency.

Pursuant to Part 107, the FAA requires that UAS operators obtain a remote pilot certificate with a small UAS rating.<sup>42</sup> To receive the remote pilot certificate, persons already holding a pilot certification must complete a Part 107 training course. All other prospective operators must pass an aeronautical knowledge test and complete a Transportation Security Administration background check.<sup>43</sup> AIA’s PIC recommendations go beyond the FAA’s requirements. Specifically, AIA recommends that applicants for PIC authority secure a license under the FCC’s Commercial Radio Operator Program, Element 3. Element 3 evaluates general radio electronic fundamentals and techniques, such as radio wave propagation, circuit components, and signals and emissions. Under this framework, a PIC would be required to pass a written exam on these topics. The FAA does not require operators of small, low-altitude UAS to illustrate knowledge of these topics, and neither should the Commission.

The FAA has jurisdiction over aircraft operations and operators, and the Commission should not confuse these issues in spectrum regulations, as the AIA Petition suggests. Recently, the Commission recognized the appropriate jurisdictional separation between itself and the FAA in seeking comment on proposed Part 90 rule amendments with respect to airborne operations in the 4.9 GHz band. In that proceeding, the Commission noted that “FAA rules and state and local

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<sup>41</sup> 14 C.F.R. § 107.3.

<sup>42</sup> 14 C.F.R. § 107.12.

<sup>43</sup> See 14 C.F.R. § 107.63 *et seq.*

ordinances on aviation would take precedence over our proposed altitude transmission limits.”<sup>44</sup>

Just as the Commission recognizes the FAA’s authority with respect to altitude limitations, the Commission also should defer to the FAA as the expert agency with respect to aircraft definitions, and operator qualifications and certifications.

## **VI. CONCLUSION.**

A forthcoming NPRM in this proceeding would be the first opportunity for the Commission to develop service rules specifically for UAS. As the Commission moves forward, it is important that it not create precedent with the 5030-5091 MHz band, including regulation under Part 87, which would limit the use of other spectrum bands for UAS. Wireless networks and devices offer great promise for UAS communications across a variety of use cases.

Implementation of the AIA Petition’s proposals could have unintended consequences that would inhibit the ability of UAS operators to use wireless services that are commercially available today. In order to support the greatest number of UAS operations and realize the full economic potential of UAS, the Commission must ensure that it neither imposes a particular spectrum band or technological solution on all UAS, such as the 5030-5091 MHz band, nor precludes UAS operators from accessing spectrum needed to support emerging operations. Vagaries in the AIA Petition make it difficult to ascertain which of these approaches, if either, it is suggesting. The UAS market is continuously changing and growing, and the Commission’s approach must remain flexible and technology-neutral.

Respectfully submitted  
/s/ Jackie McCarthy  
Jackie McCarthy

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<sup>44</sup> *Amendment of Part 90 of the Commission’s Rules*, WP Docket No. 07-100, Sixth Further Notice of Proposed Rulemaking, FCC 18-33, at ¶ 20, n. 50 (2018).



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